

STATE OF CALIFORNIA
AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME V

STANDARD OPERATING PROCEDURES
FOR
AIR QUALITY MONITORING

APPENDIX K

PERFORMANCE AUDIT PROCEDURES
FOR
PARTICULATE MATTER (PM10) IONS LABORATORY AUDITS

MONITORING AND LABORATORY DIVISION

AUGUST 2002

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APPENDIX K
PERFORMANCE AUDIT PROCEDURES
FOR
PARTICULATE MATTER (PM10) IONS LABORATORY AUDITS
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APPENDIX K.1

PERFORMANCE AUDIT PROCEDURES
FOR
PARTICULATE MATTER (PM10) IONS LABORATORY AUDITS

MONITORING AND LABORATORY DIVISION

DECEMBER 1996

K.1.0 INTRODUCTION

K.1.0.1 GENERAL INFORMATION

Audits for particulate matter (PM10) ions are conducted at the Inorganics Laboratory Section of the Air Resources Board's (ARB) Monitoring and Laboratory Division (MLD). On a quarterly basis, ARB purchases the standard samples from Inorganic Ventures, Inc. A sample filter set, with accompanying data forms, is sent to the ARE Quality Assurance Section (QAS) which forwards it to the MLD's Inorganics Laboratory Section for analysis. The laboratory uses ion chromatography and follows Standard Operating Procedures (SOP) Numbers MLD 007 and 023 for processing and analysis. The sample is analyzed to determine the amounts of ammonium (NH₄), potassium (K), sulfate (SO₄), nitrate (NO₃), and chloride (Cl) in the sample filter. The results are returned to the QAS for calculation of the percent bias of the sample for NH₄, K, SO₄, NO₃, and Cl.

The purpose of the audit is to assess the accuracy of the laboratory's operating practices and procedures.

K.1.1 AUDIT PROCEDURES

K.1.1.1 INITIATION OF AUDIT

Upon receiving the Inorganic Ventures audit filters, the QAS will document receipt of the filters and accompanying data forms. The filters will accompany an audit initiation memorandum (Fig. K.1.1.1) which will be forwarded to the Inorganics Laboratory for analysis.

K.1.1.2 STANDARD OPERATING PROCEDURES

All filters supplied by the Inorganic Ventures and audited at the Inorganics Laboratory are processed using SOP Numbers MLD 007 and 023.

K.1.1.3 COMPLETION OF AUDIT

Upon completion of filter processing and analysis, the Inorganics Laboratory Section returns results containing raw data and any additional comments or information to the QAS via electronic mail.



Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman

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Governor

MEMORANDUM

TO: Mike Poore, Chief
Northern Laboratory Branch

THROUGH: Jeff Cook, Chief
Quality Management Branch

FROM: Michael Miguel, Manager
Quality Assurance Section

DATE: August 2, 2001

SUBJECT: THIRD QUARTER 2001 PM10 ION AUDITS

Your staff recently received the materials needed to perform an audit for PM10 ions. The materials have been given to Roxanna Walker. Please follow your standard operating procedures when analyzing the samples and return the results to me by August 20, 2001.

Thank you for your participation in this program. If you have any questions, please contact Mark Tang of my staff at 324-1149.

cc: Roxanna Walker
Mark Tang

California Environmental Protection Agency

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Figure K.1.1.1
PM10 Ion Audit Initiation Memorandum

K.1.2 POST AUDIT CALCULATIONS

K.1.2.1 CALCULATION OF PERCENT BIAS

The QAS shall calculate the percent bias between the Inorganics Laboratory Section's measured results and Inorganic Ventures' assigned results using the following equation (results are recorded in micrograms (ug) /filter):

$$\text{Percent Bias} = \frac{(\text{Measured Concentration} - \text{Assigned Concentration})}{\text{Assigned Concentration}} \times 100$$

K.1.2.2 FINAL AUDIT REPORT

The QAS will forward the final results with a cover letter (Fig. K.1.2.1) to the Inorganics Laboratory Section. In the event that the percent bias exceeds $\pm 10\%$, the laboratory will be asked to investigate the cause of the bias. In addition, the QAS will include recommendations for reducing the bias.



Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman

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Governor

MEMORANDUM

TO: Mike Poore, Chief
Northern Laboratory Branch

THROUGH: Jeff Cook, Chief
Quality Management Branch

Michael Miguel, Manager
Quality Assurance Section

FROM: Mark Tang, Student Assistant
Quality Assurance Section

DATE: September 7, 2001

SUBJECT: PM10 IONS AND CATIONS LABORATORY PERFORMANCE AUDIT RESULTS
THIRD QUARTER 2001

The following table represents your audit results for the first quarter 2001 particulate matter (PM10) ions and cations laboratory performance audit. The performance audit was conducted using vendor-manufactured filters spiked with nitrate (NO₃), sulfate (SO₄), chloride (Cl), ammonium (NH₄), and potassium (K) ions. The Inorganics Laboratory Section utilized ion chromatography (Method 007 ad 023) to determine the concentrations of the ions spiked onto the filters. The laboratory results are as follows (concentration values are micrograms per filter strip):

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Figure K.1.2.1
PM10 Ion Audit Final Results Cover Letter

Mike Poore
September 7, 2001
Page 2

Ion	Sample Number	Reported Values	Reference Values	*Percent Difference
NO ₃	1B	<LOD	0	-
	2B	215	224	-4.0
	3B	633	641	-1.2
	4B	945	1008	-6.3
SO ₄	1B	<LOD	0	-
	2B	516	527	-2.1
	3B	1628	1654	-1.6
	4B	2562	2709	-5.4
Cl	1B	<LOD	0	-
	2B	133	119	11.8
	3B	316	310	1.9
	4B	536	562	-4.6
NH ₄	1B	<LOD	0	-
	2B	200	177	13.0
	3B	349	319	9.4
	4B	755	706	6.9
K	1B	<LOD	0	-
	2B	142	132	7.6
	3B	361	341	5.9
	4B	622	619	0.5

*Percent Difference = $\frac{\text{Reported Values} - \text{Reference Values}}{\text{Reference Values}} \times 100$

All compounds were within the targeted +/-20% control limit established for the audit procedure. In addition, the compound Chlorine was detected by your laboratory on filter 2B-NH₄, which was only spiked with a known concentration of Ammonium. The Quality Assurance Section recommends that your laboratory investigate the cause.

The next scheduled audit is to take place during the first quarter, 2002.

Thank you for your participation in this program. If you have any questions, please call Mark Tang of my staff at 324-1149.

cc: Russell Grace
Roxanna Walker
Merrin Bueto
Mark Tang